

NATURAL RESOURCES CONSERVATION SERVICE
PACIFIC BASIN AREA
CONSERVATION PRACTICE STANDARD

FILTER STRIP

(Hectare, Acre)
CODE 393A

DEFINITION

A strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater.

PURPOSE

To remove sediment and other pollutants from runoff or waste water by filtration, deposition, infiltration, absorption, adsorption, decomposition, and volatilization, thereby reducing pollution and protecting the environment.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies:

1. On cropland at the lower edge of fields or above conservation practices such as terraces or diversions, or on fields adjacent to streams, ponds, and lakes;
2. In areas requiring filter strips as part of a waste management system to treat polluted runoff or waste water; and,
3. On forestland where filter strips are needed as part of a forestry operation to reduce delivery of sediment into waterways.

CRITERIA

General Criteria Applicable to All Purposes

No plants listed on the noxious weed list of the local political entity will be established in the filter strip.

Filter strips generally are not a stand alone practice. They remove only a portion of the sediment and other pollutants in agricultural runoff. Filter strips should be used in conjunction with practices that reduce erosion, treat and store animal waste and/or improve nutrient and pesticide management.

Filter strips are a part of a water treatment system and should not be used as a recreation area, field road or travel lane.

Design Criteria for Filter Strips for Runoff From Concentrated Livestock areas.

These criteria apply to filter strips to be used for feedlot and barnyard runoff.

A settling basin, vegetated barrier, or low velocity channel shall be provided between the waste source and filter strip where more than 100 animal units (AU) are confined (1 AU is equivalent to 1000 lb. or 454 kilograms of animal weight).

A constructed settling basin, if needed, shall have sufficient capacity, to store the runoff computed for 15 minutes duration at the peak inflow rate resulting from a 2-year, 24 hour rainfall. Any basin outflow shall be disregarded in computing minimum storage. Additional storage capacity, based on frequency of cleaning, shall be provided for manure and other solids settled within the basin. When the basin is cleaned after every significant runoff event, additional storage equivalent to at least 0.5 inches (1.3 cm) from the concentrated waste area shall be provided. If only annual cleaning of the basin is planned, additional storage equivalent to at least 6 in. (15 cm) from the concentrated waste area shall be provided.

A low velocity channel shall be a minimum of 75 feet long (23 m). It shall be designed for a flow depth of 0.5 ft (15 cm) or less to pass the peak flow resulting from a 2-year, 24 hour rainfall at a velocity of 0.5 feet per second (0.15 m/sec) or less. Provisions shall be provided for removing settled solids from the channel as necessary to maintain its' proper function.

A filter strip may be a relatively uniform grassed area or a grassed waterway.

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Minimum dimensions shall be based on the peak outflow from the concentrated waste area or settling facility based on a 2-year, 24 hour rainfall.

Grassed area filter strips shall be generally on the contour and sufficiently wide to pass the peak flow at a depth of 0.5 inches (1.3 cm) or less. Flow length shall be sufficient to provide at least 15 minutes of flow-through time.

Grassed waterway filter strips shall be designed to carry the peak flow at a depth of 0.5 feet (15 cm) or less. Flow length shall be sufficient to provide at least 30 minutes of flow-through time. Grass species and shape of channel shall be such that grass stems will remain upright during design flow.

Additional Criteria for Filter Strips for Controlled Overland Flow Treatment of Liquid Wastes

These criteria apply to filter strips for wastewater from milk parlors, milking centers, waste treatment lagoons, food processing plants, and animal waste storage facilities.

Overland flow filter strips shall be installed on natural or constructed slopes of 2 to 6 percent. They shall have minimum flow lengths of 100 feet (31 m) on 2 percent slopes and proportionately up to 300 ft on 6 percent slopes. Weekly wastewater application rates should not exceed 6 inches (115 cm) and should be decreased to 2 inches (5 cm) or less for highly concentrated wastes. Daily application times should not exceed 6 hours, and should be decreased to 2 hours for more concentrated wastes such as that from animal waste storage facilities. Filter strips should be rested at least 2 days each week.

Additional Criteria for Filter Strips for Trapping Sediment and Related Pollutants

These criteria apply to filter strips on cropland at the lower edge of fields, on fields, on pastures, or in manure spreading areas adjacent to streams, ponds, and lakes, and above conservation practices such as terraces or diversions.

Consider the following physical characteristics of the site when designing filter strip width and flow length:

1. The soils, average slope, and filtration rate for the area above the filter strip and the filter strip itself.
2. The vegetative cover, cropping sequence, crop and tillage management patterns, and crop residue use in the drainage area that will contribute runoff to the filter strip.
3. The total drainage area contributing runoff to the filter strip.
4. Filter strips will be designed to treat sheet flow. If concentrated flow will occur, grading or shaping will be needed to insure sheet flow through the filter strip.
5. Construction or installation of any filter strip should not alter the general drainage pattern or flooding potential of an area.
6. Design the filter strip for the type and quantities of potential pollutants that will be in the runoff generated by the drainage area.
7. The length of flow through vigorous vegetation shall be at least 20 feet (6.1 m) for slopes of less than one percent installed on permeable soils. The width shall be proportionally wider for steeper slopes and or less permeable soils.
8. Slope measurement applies to both the filter strip and the area producing runoff. If the runoff producing area is steeper than the filter strip area, size the filter strip according to the steeper area.

Additional Criteria for Filter Strips on Forestland.

These criteria apply to filter strips for runoff as part of a forestry operation to reduce delivery of sediment into waterways.

As a guide, the length of flow through undisturbed forest floor should be at least 25 feet (7.6 m) for slopes of less than one percent and proportionately increased to 65 feet (20 m) for 30 percent slopes and at least 150 feet (46 m) for 70 percent slopes.

CONSIDERATIONS

PLANNING

1. Document characteristics of watershed area that would contribute runoff to filter strip.
2. Determine watershed size, soils, cover/land use, general slope, relative infiltration rate and probability of concentrated flow occurring.
3. Determine the size and the placement of the filter strip needed to control targeted pollutants.
4. Prepare a layout map or plan to indicate placement, flow length, and width of filter strip.
5. Evaluate type and quantity of target pollutant, slopes and soils, adapted vegetative species, time of year for proper establishment of vegetation, necessity for irrigation, visual aspects, fire hazards, and their special needs.
6. Prevent erosion where filters flow into streams or channels. If filter strips are to be used in treating wastewater or polluted runoff from concentrated livestock areas, the following must be considered:
7. Adequate soil drainage to ensure satisfactory performance.
8. Provisions for preventing continuous or daily discharge of liquid wastes unless the area is adequate for infiltrating daily applied effluent. Temporary storage should be considered to prevent discharge to the filter strip more frequently than once every 3 days.
9. Enough rest periods to maintain an aerobic soil profile. Storage or alternating filter strips may be desirable.
10. An adequate filter area and length of flow to provide the desired reduction of pollutants. A serpentine or switchback channel can be used to provide greater length of flow.
11. Provisions for excluding roof water and unpolluted surface runoff.
12. Slopes less than 5 percent are more effective; steeper slopes require a greater area and length of flow.
13. Provisions for mowing and removing vegetation to maintain the effectiveness of the filter area. While not generally

recommended, controlled grazing may be satisfactory when the filter area is dry and firm.

14. The need for a level lip weir, gated pipe, sprinklers, or other facilities to distribute flow uniformly across the top of the filter strip and maintain sheetflow through the strip.

WATER QUALITY

Filter strips by themselves generally do not meet the "no-discharge" requirement applicable to livestock operations requiring permits under the National Pollutant Discharge Elimination System.

More stringent pollution abatement measures may also be necessary where receiving waters must be highly protected.

Vegetative Species for Filter Strips

Select adapted vegetation for establishment as part of the filter strip.

Refer to Pacific Basin plant lists, referenced in Section I of the FOTG, for descriptions of adapted plants that meet site conditions.

Consider the adapted vegetative species or existing species in the area.

A Plant Materials Specialist should be consulted when a plant species not on any Pacific Basin list is planned for or to assist in determining appropriate plant characteristics when native vegetation will be used as a filter strip.

The vegetative species selected for the filter strip should be vigorous, dense and capable of remaining upright in heavy flows. It should be tolerant of relatively wet and dry conditions and be capable of recovering quickly from inundation with water and sediment. The cover selected should favor sheet flow. Generally, sod forming grasses distribute flow more evenly than bunch grasses. If a bunch grass is the most adaptable species for the area, a dense and even stand will be the most effective.

Refer to the Pacific Basin standards for Pesticide Management (595) and Nutrient Management (590) if pesticides and fertilizers

are to be used. Consider water quality effects on surface and ground water when using these materials.

Ground Water. Consider the development stage, utility, vulnerability, and any known water quality impairments of the ground water.

Surface Water. Consider the receiving surface water bodies within the hydrologic units. Identify and implement laws and permits for designated use and impacts from run-off. Identify any other natural resources (endangered species, wildlife habitat, etc.) within the watershed and consider the potential effect of the filter strip on these resources.

Filter strips should avoid streambank areas subject to federal or local permit requirements.

Consider:

1. Effects on the nutrient budget within the filter strip as related to removal, residence, or accumulation of nutrients. Nutrient budgets should account for effects of growing and decaying vegetation.
2. Filtering effects of vegetation on movement of sediment, pathogens, organic loads, and dissolved and sediment-attached substances.
3. Effects of the filter strip vegetation's uptake of nutrients on surface and ground water.
4. Effects of the timing of the vegetation's management, including clipping, harvesting, removal, and reestablishment on the nutrient balance within the filter strip.
5. Effects on the visual quality of on-site and downstream water resources.
6. Filter strips for sediment and related pollutants meeting minimum requirements may trap the coarser grained sediment.
7. Filter strips for runoff from concentrated livestock facilities may trap organic material, solids, materials that become absorbed to the vegetation or the soil within the filter.

8. Filter strips for controlled overland flow treatment of liquid wastes may effectively filter out pollutants.

WATER QUANTITY

Effects on the water budget, especially on volumes and rates of runoff, infiltration, evapotranspiration, deep percolation, and ground water recharge.

Effects caused by seasonal weather variations.

Effects of the filter strip vegetation on soil moisture.

Effects on the volume of soil water caused by changes in plant growth and transpiration.

Effects of vegetation on water retention within the filter strip.

PLANS AND SPECIFICATIONS

All trees, stumps, brush, rocks, and similar materials that can interfere with installing the filter strip shall be removed.

The materials shall be disposed of in a manner that is consistent with the standards for maintaining and improving the quality of the environment and with proper functioning of the filter strip.

Construction drawings and specifications for this practice shall include a plan view drawn to scale, details of effluent distribution (when applicable), topsoil salvaging and spreading, and spoil disposal.

Seedbed preparation requirements, planting dates, adapted vegetative species, seeding or sprigging rates, need for mulch or stabilizer crops, fertilizer and soil amendment requirements, required mechanical means of stabilizing, irrigation requirements, and weed control requirements shall specified on the plan.

OPERATION AND MAINTENANCE

The landowner or operator shall take proper procedures to insure that buried or overhead utilities will not be jeopardized and that equipment operators and others will not be injured during construction operations.

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A written description of operation and maintenance requirements shall be provided for each filter strip installed for all purposes.

The filter strip and its vegetation must be periodically maintained and free of debris. Mowing and sediment removal should be part of the planned maintenance of the filter strip. Proper maintenance and removal of all debris in the vicinity of the filter strip is necessary for the filter strips to properly function.

Needed repairs must be made immediately to reestablish sheet flow. A shallow furrow on the contour across the filter can be used to reestablish sheet flow. Vegetation must be maintained in a vigorous condition. If livestock have access to the filter area, it must be fenced to control grazing. Development of rills and small channels within filter areas must be minimized.